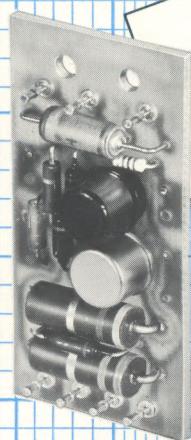


MICRO SWITCH BULLETIN ED



MICROSECOND PULSE
ONE-SHOT
SWITCH/CIRCUITS
Single pulse --- faster
than possible manually



MILLISECOND PULSE
ONE-SHOT
SWITCH/CIRCUITS
Regulated Pulse that
Drives Relays



UNTIMED PULSE
CONTACT BUFFER
Single pulse clarity
without contact bounce

ELECTRONIC PULSE CIRCUITS and Switch Circuit Assemblies

ED circuits provide
shaped-wave, single-pulse output -
- without contact bounce.

- Wide range of pulse widths
and output voltages
- Eliminates engineering time
on components -- Saves assembly
- Compact Size -- Low Price --
Uniform Operation -- Long Life

MICRO SWITCH PULSE CIRCUITS

MICRO SWITCH Electronic Pulse Circuits are offered for three distinct pulse durations --- microsecond pulses, millisecond pulses, or untimed pulses. All pulse circuits are engineered to provide a single (shaped) output wave per actuation of the controlling switch. These devices produce one and only one pulse in applications where mechanical contacts create more than a single pulse before they stabilize in position. The chart inside represents a composite of the output characteristics of all pulse devices offered. It enables a quick visualization of devices that produce the desired pulse width and output voltage.



MICRO SWITCH E

MICROSECOND PULSE ONE-SHOT

SERIES 401ED for Printed Circuit Boards

Assembles directly on printed circuit boards.
Meets applicable sections of MIL Std. 202.
Pulse width range from 0.1 to 2.5 microseconds.
Requires separate controlling switch.
Detailed information on Page 4

SERIES 100ED & 200ED

Available as circuit or as switch/circuit assembly to
save installation.
Pulse width range from 0.1 to 10.0 microseconds.
Detailed information on Page 6

SERIES 301ED

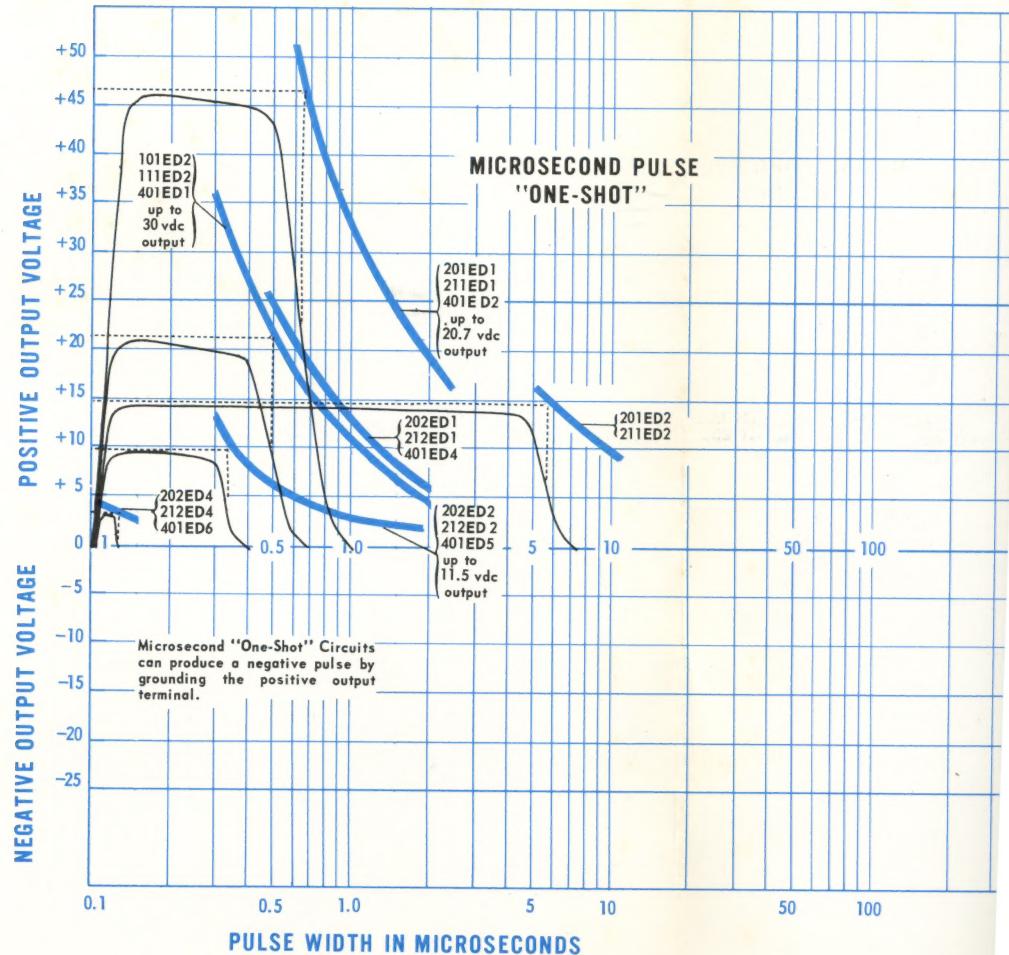
Available as circuit or
save installation.
Four pulse widths offered.
Handles loads to 300 ohms.
6 to 20 volts and 20 to 300 milliamperes.
Detailed information on Page 7

Typical Applications

Computer Registry Control and Related Peripheral Equipment
 ● Electronic Test Equipment and Oscilloscopes ● Data Links
 ● Keyboard Strobes ● Checking Ring Counters ● Radar
 ● Single Bit Applications

Ty

Ordnance
 ● Constant Current
 ● Welding



CRO SWITCH Electronic Pulse Circuits

MILLISECOND PULSE ONE-SHOT

SERIES 301ED

Available as circuit only or switch/circuit assembly to save installation.

Four pulse widths offered, 30, 75, 200 and 500 milliseconds.
Handles loads to 300 ma in two voltage versions - - -
6 to 20 volts and 20 to 55 volts.

Detailed information on Page 8

Detailed information on Page 6

UNTIMED PULSE CONTACT BUFFER

SERIES 2ED

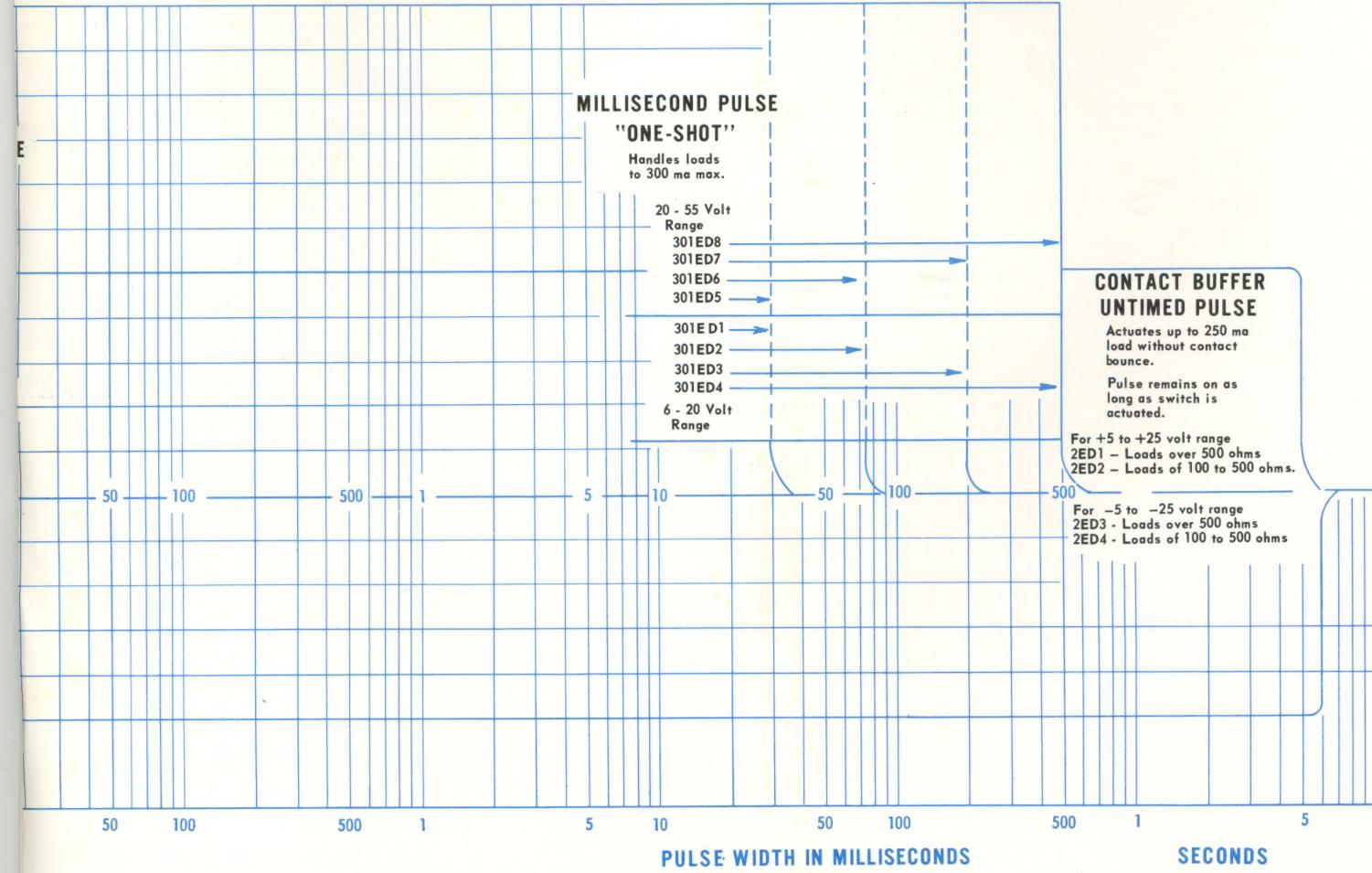
Available as circuit or as switch/circuit assembly to save installation.

Pulse remains ON as long as switch held actuated
Handles loads to 250 ma in two voltage versions - - -
+5 to +25 volts and -5 to -25 volts.

Detailed information on Page 9

Typical Applications

- Ordnance Firing Circuits • Photographic Controls • Solid State and Electromagnetic Sequencing
- Constant Factor measurement based on Regulated Time Pulse for Mixing-Fill • Induction Heaters
- Welding Equipment • Relay and Solenoid Control



CHARACTERISTICS OF MICROSECOND "ONE-SHOT" CIRCUITS

Microsecond "One-Shot" Circuits (Series 100ED, 200ED, and 401ED) provide a single pulse in which the pulse width is inversely proportional to the output voltage. The example chart contains numerals which correspond to the following descriptions:

1 DEVICE CHARACTERISTICS

These curved lines plot the coordinates of this circuit. From known data, i.e., input or output voltage, pulse width, or load impedance; the balance of the device characteristics can be determined.

Chart Example: (Known factors are underlined)

Supply Voltage	Load Impedance	Output Voltage	Pulse Width in Microseconds
20 vdc	2200 ohms	20.5 vdc	0.55
20 vdc	470 ohms	18.5 vdc	0.60
14.5 vdc	2200 ohms	15 vdc	0.75
16.5	470 ohms	15 vdc	0.75
11 vdc	2200 ohms	11.25 vdc	1.00
12 vdc	470 ohms	11.25 vdc	1.00

2 DC SUPPLY VOLTAGE - E_b

Right hand curve on chart shows minimum and maximum workable input voltage range. In this example, 6 vdc is the minimum and 25 vdc is the maximum. Circuits will not be damaged below the minimum input voltage; but pulse shape is degraded or noise produced. Circuits may be destroyed above upper voltage limit. Charts are plotted with the DC supply voltage and the controlling switch in close proximity to the circuit.

3 LOAD IMPEDANCE

The load impedance (including long lead wire length between the circuit and load) affects the pulse width and output voltage. The load impedance range shown specifies the area in which the device produces a single undistorted pulse per actuation of the controlling switch. Within the specified impedance range, output voltage increases with increasing impedance and pulse width decreases with increasing impedance.

The maximum load impedance (2200 ohms in this example), is represented by angular parallel lines for ease in determining any intermediate supply voltage points. Load impedances above the recommended maximum may create second pulses. A terminating resistor wired in parallel with the load will minimize this effect.

The minimum load impedance (470 ohms in this example) is represented by angular parallel lines for ease in plotting any intermediate supply voltage points. Load impedances below the recommended minimum value lengthen rise time and lower output voltage.

4 PULSE WIDTH IN MICROSECONDS - PW

The abscissa of this chart describes the minimum and maximum pulse widths provided by this device. In this example, the minimum pulse width is 0.45 microseconds. The maximum is 2.0 microseconds. The pulse width is measured at 50% amplitude of the output voltage. (Charts for 202ED4, 212ED4 and 401ED6 shown on subsequent pages are measured at 10% amplitude due to the small pulse produced). Standard Manufacturing tolerance is $\pm 20\%$.

5 OUTPUT VOLTAGE - E_o

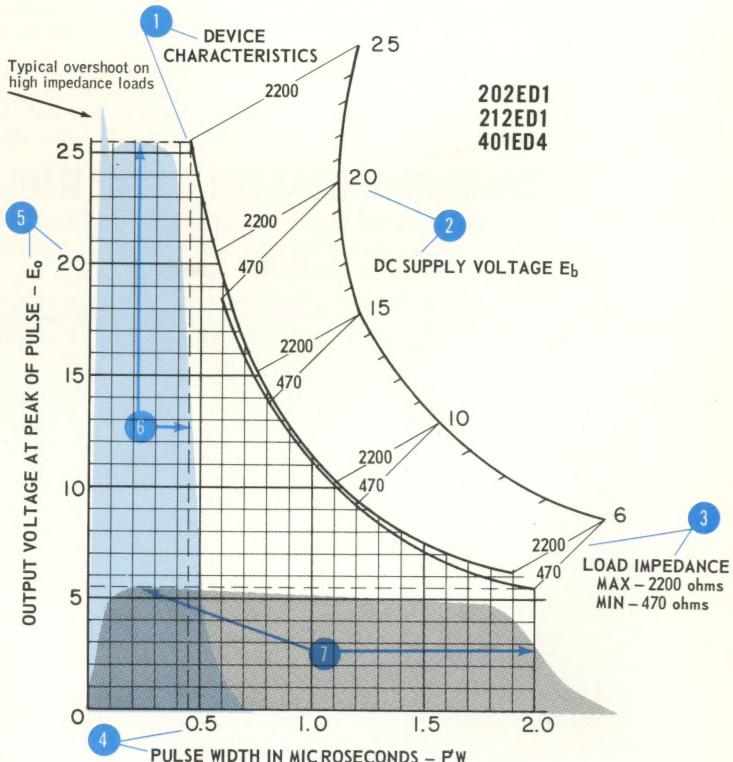
The ordinate of this chart specifies the minimum and maximum output voltages provided by this device. In this example, the maximum output voltage is 25.5 volts; the minimum is 5.5 volts. Output voltage is measured at the peak of a one-shot pulse. Standard Manufacturing tolerance is $\pm 10\%$.

6 TYPICAL PULSE

In this example, this pulse consists of the maximum supply voltage (25 volts), and the maximum load impedance (2200 ohms). Under these conditions, the output voltage is 25.5 volts (maximum) and is shown with a vertical arrow. The pulse width is 0.45 microseconds (minimum) and is shown with an arrow pointing to the 50% amplitude point. Because of the high impedance of this load (2200 ohms), a typical overshoot of the output voltage is produced. This overshoot appears on all like pulses at lower voltages, but is of a lower value.

7 TYPICAL PULSE

In this example, this pulse consists of the minimum supply voltage (6 volts) and the minimum load impedance (470 ohms). Under these conditions, the output voltage is 5.5 volts (minimum) and its measuring point is shown with a diagonal arrow. The pulse width is 2.0 microseconds (maximum) and is shown with a horizontal arrow. This typical pulse is as it appears on an oscilloscope.



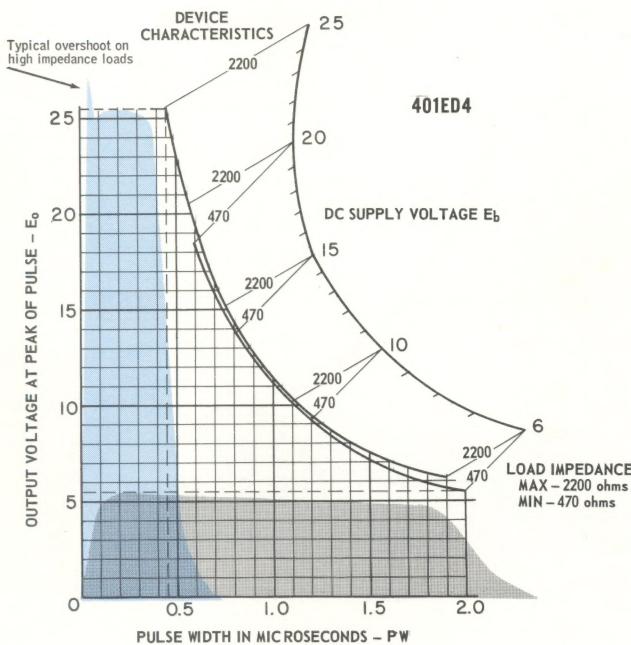
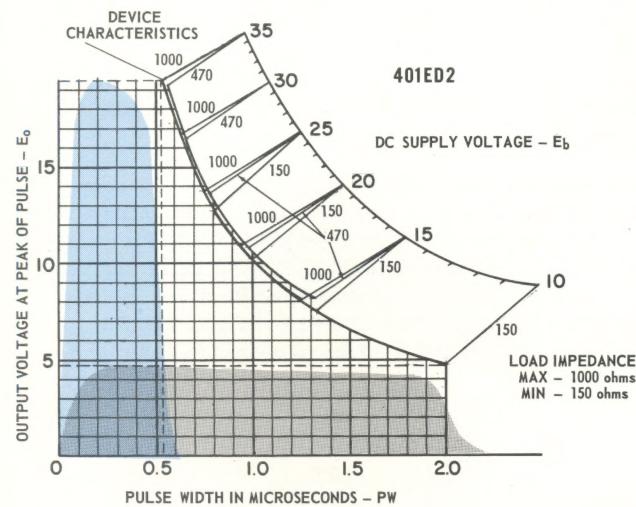
Series 401ED "One-Shot" Circuits for Printed Circuits

These "One-Shot" Circuits produce a single pulse of voltage from 0.1 to 2.5 microseconds duration, depending on the device selected, the load impedance and the supply voltage. The single pulse is independent of the length of time the switch is actuated.

TEST DATA

Series 401ED circuits have been tested to, and pass, the following test procedures of MIL Std 202C. Circuit characteristics were measured before and after each of the following tests for conformance to their specifications:

Moisture Resistance: Procedure 106B. Ten day test in 90-98% relative humidity. Temperature alternately cycled 5½ hours at +149°F and 5 hours at +77°F, 24 hours daily.

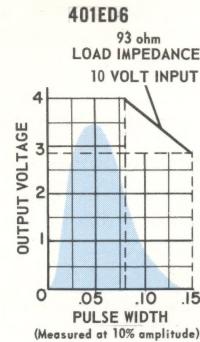
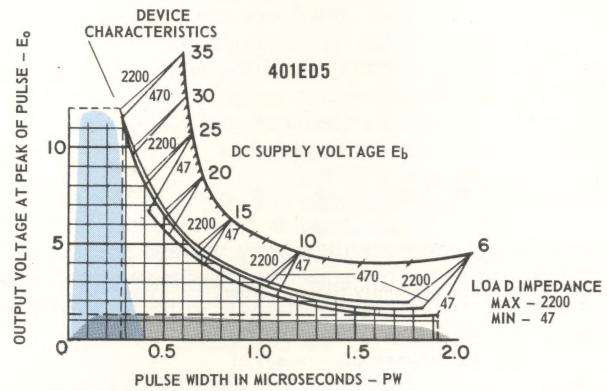
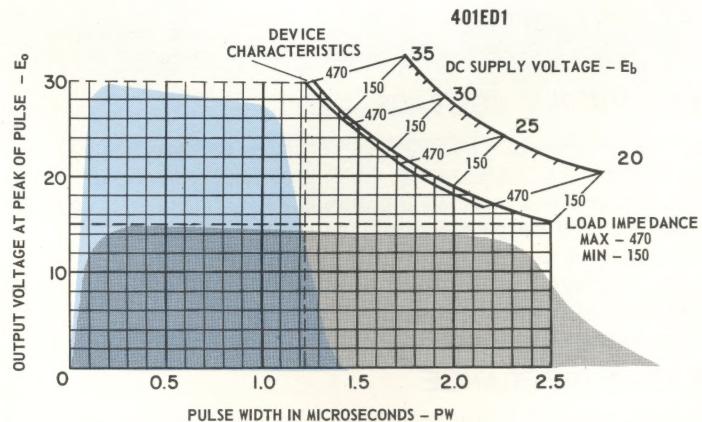


The charts below show the device characteristics---a composite of all pulse points obtainable from each circuit. Each chart represents a single circuit. Instructions for these charts are shown on Page 3

Salt Spray (Corrosion): Procedure 101A. Condition A. Four days of 24 hour operation at 95°F in the presence of 20% salt solution fog.
Vibration: Procedure 201A. 10 to 55 to 10 cps vibration in each of 3 mutually perpendicular axes. Each axis vibration tested two hours for a total of 6 hours.

Shock: Procedure 202B. Subjected to 50G shocks, 3 times in each of 3 mutually perpendicular axes.

Temperature Cycling: Procedure 102A, Condition D. Five complete temperature cycling tests consisting of 30 minutes at -65°F; 15 minutes at +77°F; 30 minutes at +185°F and 15 minutes at +77°F. On final temperature cycle, circuits were measured for conformance to circuit specifications at both temperature extremes.



Series 401ED Specifications

"One-Shot" Circuit Catalog Listing	Range of DC Supply Voltage	Range of Load Impedance	Resultant Pulse Width (PW) in Microseconds	Resultant Output Voltage (E_o)
401ED1	20 to 35	to 150 Ohms to 470 Ohms	2.5 to 1.4 2.2 to 1.2	15 to 26.25 17 to 29.8
401ED2	10 to 25	150 Ohms	2.0 to 0.7	4.9 to 12.9
	15 to 35	470 Ohms	1.3 to 0.5	8.0 to 19.4
	15 to 35	1000 Ohms	1.2 to 0.5	8.1 to 19.5
401ED4	6 to 20	470 Ohms	2.0 to 0.6	5.5 to 18.4
	6 to 25	2200 Ohms	1.9 to 0.5	6.1 to 15.5
401ED5	6 to 25	47 Ohms	1.9 to 0.4	1.3 to 6.8
	6 to 35	470 Ohms	1.8 to 0.3	1.6 to 11.4
	6 to 35	2200 Ohms	1.8 to 0.3	1.8 to 11.8
401ED6*	10	93 Ohms	0.08 to 0.15	2.8 to 4.0

* Pulse width on 401ED6 is measured at 10% amplitude rather than 50% amplitude.

INPUT POLARITY

These circuits are polarized and require that Pin 1 is wired to the negative power source. Pin 3 becomes positive when the controlling switch is actuated. Internal circuit destruction may result if input polarity is not observed.

TEMPERATURE RANGE

Operating and Storage: -65° F to +185° F
Charts on the preceding page are plotted with an ambient temperature of +70° F. Operation of the circuit at either temperature extreme will cause a slight reshaping of the pulse width and output voltage amplitude.

Soldering Temperature at Circuit Terminals – should not exceed 600° F for longer than 10 seconds to prevent circuit damage.

NEGATIVE PULSING

Negative pulses will be produced when the positive output terminal (Pin 6) is grounded as shown in the schematic. When this terminal is not grounded, the output pulse is positive.

PULSE DISTORTION

The characteristics of these circuits are plotted with the Power Supply, the Controlling Switch, the Circuit and the Load in close proximity to each other.

Pulse distortion can occur when lead wire length increases impedance between any two points. While these circuits work best at short distances, of several feet, they can be used for remote operation without significant pulse distortion when adapted as follows:

Long Leads between Supply and Switch – Connect a 0.1 to 0.5 ufd capacitor across the Controlling Switch terminals NO and NC.

Long Leads between the Switch and the Circuit – Connect a 100 to 1000 ufd Capacitor across Pins 5 and 6 of the Circuit. The higher the load impedance, the lower the capacitance value required.

Long Leads between Circuit and Load – Connect a resistor in parallel with the load to reduce the total impedance or incorporate a regenerative circuit. Total impedance includes both the load impedance and the lead wire length to the load.

BIAS VOLTAGE

Bias Voltage in the load circuit is useful in the control of transistors. Bias the transistor to the degree that the output of the One-Shot will trigger the transistor ON or OFF as follows:

Same Polarity - When bias voltage polarity across the output terminals is the same as the terminal polarity (Pin 5 negative, Pin 6 positive), then:

- A. Voltage should not exceed 50 volts maximum since internal diode destruction may result.
- B. The usable output voltage pulse will be reduced by the amount of bias voltage.

Reverse Polarity - When bias voltage polarity is the reverse of the marked output terminal polarity (Pin 5 negative, Pin 6 positive), then:

- A. Bias current flows through the secondary winding of the core. The current should not exceed 50 ma maximum (continuous). Current limiting resistors should be used.
- B. A slight negative pulse may be produced when the switch is released with direct current in the output circuit. This can be eliminated by connecting a diode across the output as shown.

RECOMMENDED PRECISION SWITCHES

Series 401ED "One-Shot" circuits are built for actuation by a 12SM4 basic switch or equivalent. The following pushbutton switch assemblies contain the above type switch with solder terminals.

Touch-Feedback Type
Alternate Button colors shown
1PB118 - Black
1PB399 - Red
1PB116 - Green



Series 2 and 6 Switch Modules
2D 121

Requires Actuator shown in Catalog 67



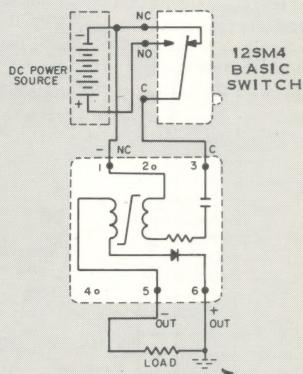
Leaf Type Compact Size
Black Button 1PB114



Light Force
Black Button 1PB115

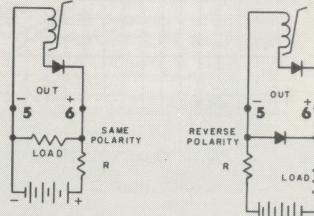


CIRCUIT SCHEMATIC



For negative pulse, ground as shown. For positive pulse, ground may be omitted or attached to negative output terminal (Pin 5)

BIAS LOAD CIRCUIT

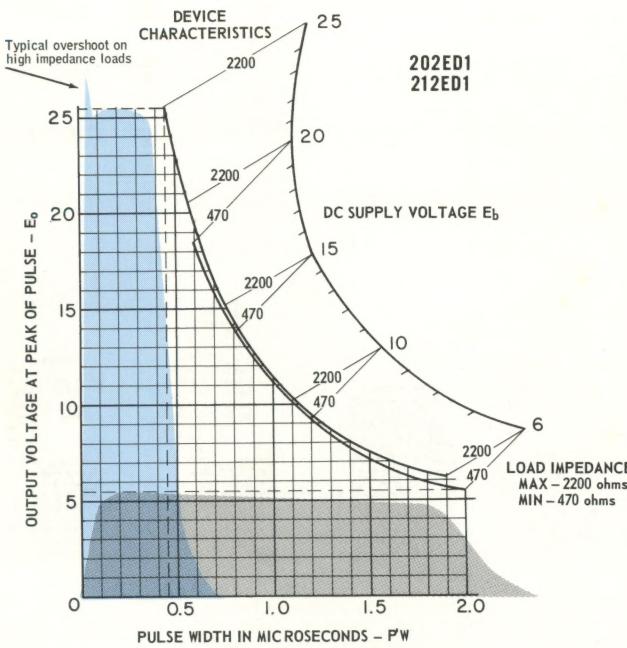
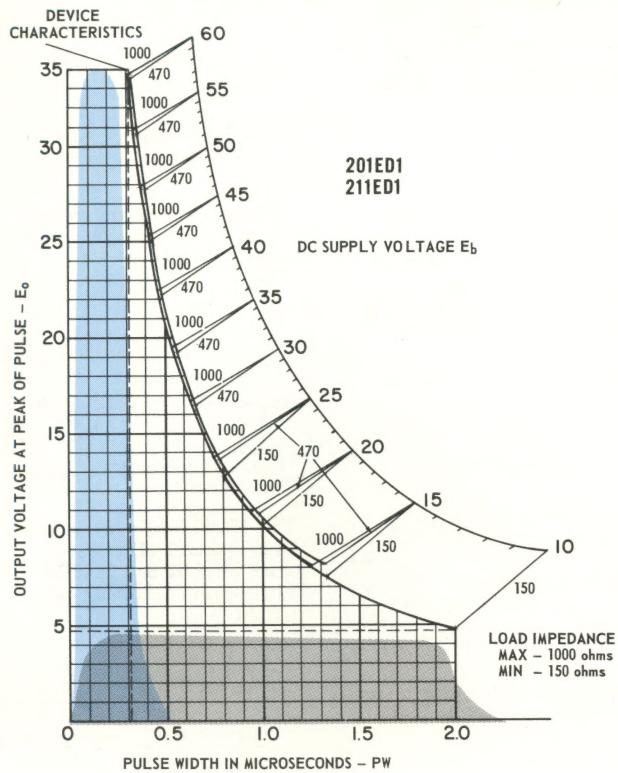


Pushbuttons listed above will also operate separate Series 100ED and 200ED circuits, except 201ED2 and 211ED2.

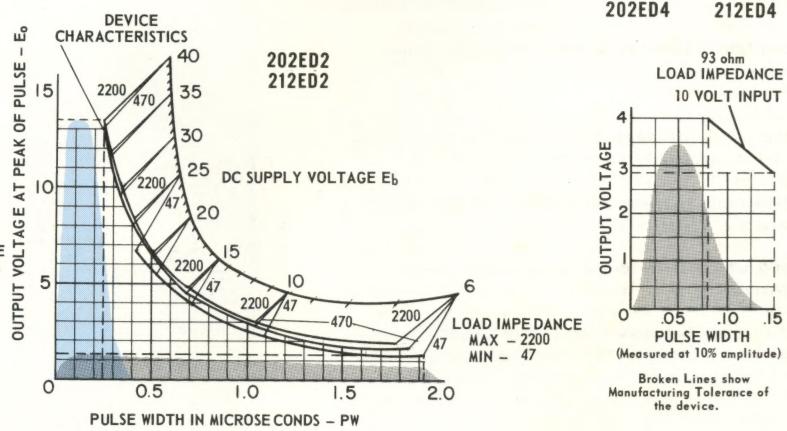
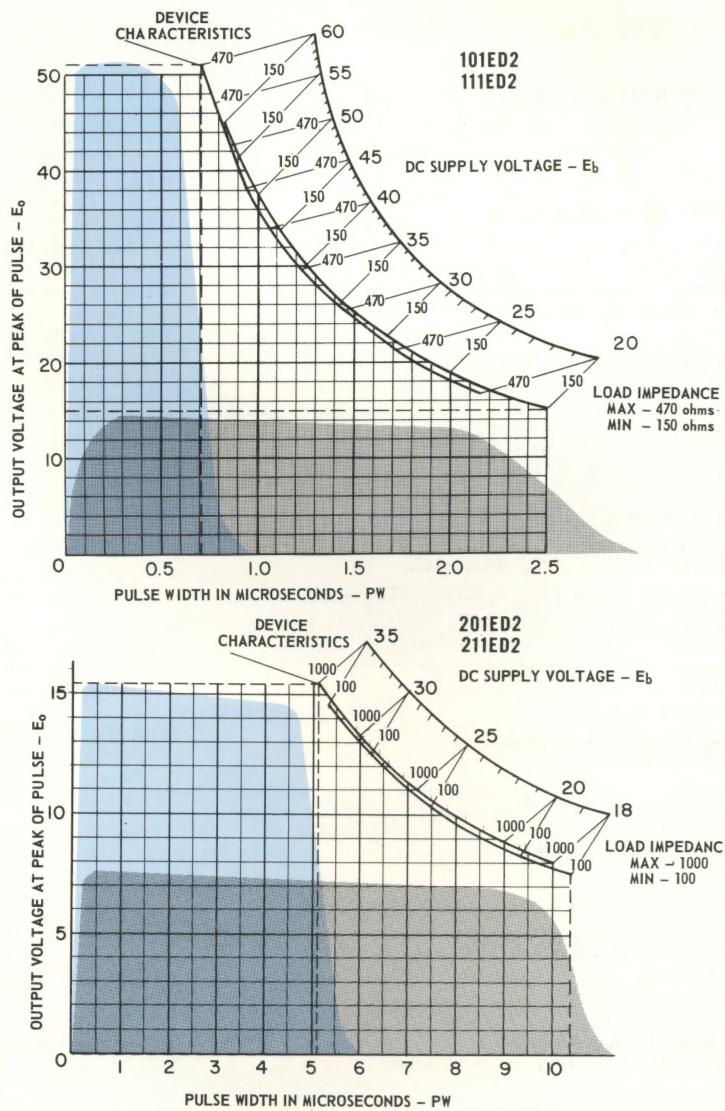
Series 100ED and 200ED Microsecond Pulse “One-Shot”

These "One-Shot" circuits produce a single pulse of voltage from 0.1 to 10.0 microseconds duration, depending on the device selected, the load impedance, and the supply voltage. The single pulse is independent of the length of time the switch is actuated. Instructions for these charts are shown on Page 3.

Instructions for these charts are shown on Page 3.



The charts below show the device characteristics---a composite of all pulse points obtainable from each circuit. Each chart represents a single circuit which can be obtained separately or in an assembly with a push-button switch. Pushbuttons containing a specific circuit are shown on the following page.



Series 100ED and 200ED Specifications

"One-Shot" Circuit Catalog Listing	Range of DC Supply Voltage	Range of Load Impedance	Resultant Pulse Width (PW) in Microseconds	Resultant Output Voltage (E_o)
101ED2 or 111ED2	20 to 60 20 to 60	to 150 Ohms 470 Ohms	2.5 to 0.8 2.2 to 0.7	15 to 45 17 to 51
201ED1 or 211ED1	10 to 25 15 to 60 15 to 60	150 Ohms 470 Ohms 1000 Ohms	2.0 to 0.7 1.3 to 0.3 1.2 to 0.3	4.9 to 12.9 8.0 to 33.5 8.1 to 33.6
201ED2 or 211ED2	18 to 35 18 to 35	100 Ohms 1000 Ohms	10.4 to 5.3 10.0 to 5.1	7.5 to 14.5 8.3 to 15.4
202ED1 or 212ED1	6 to 20 6 to 25	470 Ohms 2200 Ohms	2.0 to 0.6 1.9 to 0.5	5.5 to 18.4 6.1 to 25.5
202ED2 or 212ED2	6 to 25 6 to 40 6 to 40	47 Ohms 470 Ohms 2200 Ohms	1.9 to 0.4 1.8 to 0.25 1.8 to 0.25	1.3 to 6.5 1.6 to 13.0 1.8 to 13.1
202ED4 or 212ED4	10	93 Ohms	0.08 to 0.15	2.8 to 4.0

Each two catalog listings above (for example 101ED2 and 111ED2) contain identical circuits. Difference in catalog listing identifies controlling switch termination. See Chart Below

INPUT POLARITY

These "One-Shot" circuits are polarized. Power source poles should correspond with the marked terminal designation. Internal circuit destruction may result if input polarity is not observed.

NEGATIVE PULSING

Negative pulses will be produced when the positive output terminal is wired to ground as shown in the circuit schematic. When this terminal is not grounded, the output pulse is positive. The negative output terminal may be grounded which also produces a positive output pulse.

TEMPERATURE RANGE

Operating and Storage: -65°F to +185°F
Charts on the preceding page are plotted with an ambient temperature of +70°F. Operation of the circuit at either temperature extreme will cause a slight reshaping of the pulse width and the output voltage amplitude.

PULSE DISTORTION

The characteristics of circuits are plotted with the Power Supply, the Controlling Switch, the Circuit and the Load in close proximity to each other.

Pulse distortion can occur when lead wire length increases impedance between any two points. While these circuits work best at short distances of several feet, they can be used for remote operation without significant pulse distortion when the controlling switch is specified in one of the Switch/Circuit packages shown on this page or separate controlling switches shown on Page 5.

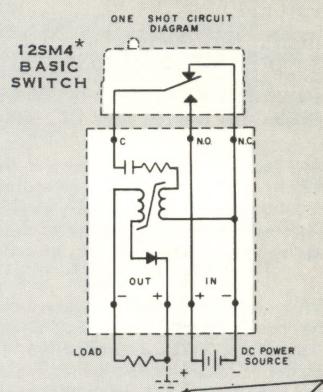
These circuits may be adapted to reduce pulse distortion as follows:

Long Leads between Supply and Input Terminals— Connect a 0.1 to 0.5 ufd capacitor across "In" terminals. Included in 202ED4 and 212ED4.

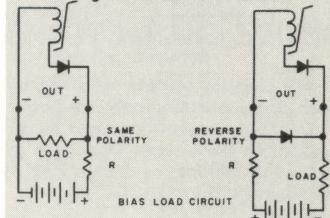
Long Leads between Switch and Circuit— Connect a 100 to 1000 ufd capacitor across the output terminals of the circuit. The higher the load impedance the lower the capacitance value required.

Long Leads between Circuit and Load— Connect a resistor in parallel with the load to reduce the total impedance or incorporate a regenerative circuit. Total impedance includes both the load impedance and the lead wire length to the load.

CIRCUIT SCHEMATIC



For negative pulse, ground as shown. For positive pulse, omit ground connection.



*The 12SM4 basic switch shown above operates all circuits except 201ED2 and 211ED2 which require a 13SM3 basic switch.

"One-Shot" Circuit Only	Circuit Shown included With Compact Size Pushbutton	Circuit Shown included With Light Force Pushbutton	"One-Shot" Circuit Only	Circuit Shown included With Touch-Feedback Pushbutton	Circuit Shown included With Series 2 and 6 Switch Module*
101ED2	1PB601	1PB612	111ED2	1PB617 (Black) 1PB624 (Red) 1PB631 (Green)	2D603*
201ED1	1PB609	1PB641	211ED1	1PB622 (Black) 1PB628 (Red) 1PB635 (Green)	2D607*
201ED2	1PB611	1PB642	211ED2	1PB623 (Black) 1PB629 (Red) 1PB636 (Green)	2D608*
202ED1	1PB604	1PB637	212ED1	1PB618 (Black) 1PB625 (Red) 1PB632 (Green)	2D604*
202ED2	1PB605	1PB638	212ED2	1PB619 (Black) 1PB626 (Red) 1PB633 (Green)	2D605*
202ED4	1PB608	1PB639	212ED4	1PB621 (Black) 1PB627 (Red) 1PB634 (Green)	2D606*

*See Cat. 67 for Actuator



Above circuits can be operated from a separate switch. For circuits with pulse widths up to 3 microseconds, use a 12SM4 basic switch or pushbuttons shown on Page 5. For circuits with pulses longer than 3 microseconds, use a 13SM3 basic switch. For Pushbuttons with 13SM3; Contact MICRO SWITCH for Catalog Listing

SERIES 301ED MILLISECOND PULSE ONE-SHOT

GENERAL

Series 301ED Millisecond "One-Shot" Circuits produce a single square wave pulse in one of four time durations: 30, 75, 200, or 500 milliseconds. These circuits handle loads up to 300 ma in two voltage ranges - - 6 to 20 volts DC, and 20 to 55 volts DC.

Any input voltage within one of these two voltage ranges produces a positive regulated time pulse. This regulated time is especially useful where the pulse is used with a constant factor to determine distance or movement, volume, weight, or quantity.

This series of circuits reduce radio frequency interference, contact bounce, and effects of contact openings due to shock and vibration. They eliminate the problems of unstable contact resistance, and produce the specified pulse irrespective of the speed the controlling contacts are actuated or the period of time the contacts are held actuated.

DEVICE CHARACTERISTICS

These circuits contain solid state components. As such, the input terminals are polarized so that the DC Power Source terminals must be of the same polarity marked on the circuit. Operation of the circuit in excess of 300 ma, or a short circuit across the output may damage the circuit.

For regulated power source (voltage variations less than 10%), connect input terminals to power source as shown in the circuit schematic. Where voltage drops exceed 10%, transient firing of the circuit can occur. A line filter shown below the circuit schematic can be used to prevent triggering the circuit.

TEMPERATURE RANGE

Operation: +32° F to +131° F
Storage: -65° F to +185° F

Soldering lead wires to circuit terminals should not exceed 600° F for longer than 10 seconds.

PULSE LENGTH IN MILLISECONDS	INPUT VOLTAGE RANGE	ONE-SHOT CIRCUIT ONLY
30	6 to 20 vdc	301ED1
75	6 to 20 vdc	301ED2
200	6 to 20 vdc	301ED3
500	6 to 20 vdc	301ED4
30	20 to 55 vdc	301ED5
75	20 to 55 vdc	301ED6
200	20 to 55 vdc	301ED7
500	20 to 55 vdc	301ED8

INPUT VOLTAGE RANGE
6 to 20 vdc
20 to 55 vdc
20 to 55 vdc
20 to 55 vdc
20 to 55 vdc

ONE-SHOT CIRCUIT ONLY
301ED1
301ED2
301ED3
301ED4
301ED5
301ED6
301ED7
301ED8



CHANGING PULSE WIDTH

A timing resistor and a timing capacitor are wired to the back of these circuits. They provide the pulse width described in the Catalog Listing with a Standard Manufacturing Tolerance of $\pm 20\%$. The pulse duration can be shortened or lengthened in the following manner:

To Shorten Pulses

Add a resistor in parallel with the timing resistor, or; Substitute the timing capacitor with a lower value, or; Substitute the timing resistor with a lower value - - -

(3.3K Ohms Min. for pulses on 301ED1 to 301ED4)
(8.2K Ohms Min. for pulses on 301ED5 to 301ED8)

To Lengthen Pulses

Add a capacitor in parallel with the timing capacitor, or; Substitute the timing capacitor with a higher value, or; Substitute the timing resistor with a higher value - - -

(30K Ohms Max. for pulses on 301ED1 to 301ED4)
(72K Ohms Max. for pulses on 301ED5 to 301ED8)

Alteration of the timing circuit can produce pulses ranging from 5 to 600 milliseconds. To alter circuit for a different pulse width, use resistance or capacitance decade equipment, and the circuit of closest pulse duration to the time required.

SPECIFICATIONS

Typical Rise Time: 0.50 microseconds
Typical Fall Time: Fall time increases with increased load values and pulse width duration. For load resistances less than 100 ohms, fall time is less than 30 milliseconds for the longest pulse width. For load resistances at 10,000 ohms, fall time is 200 milliseconds for the longest pulse width. See Output Characteristics chart above for typical pulse shape.

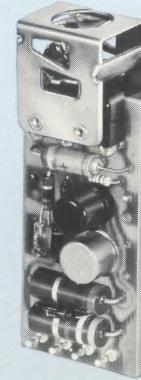
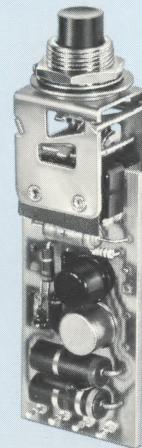
CIRCUIT ASSEMBLIES

Circuits may be operated remotely from a wide variety of MICRO SWITCH Switches; i.e., many SPDT basic and limit switches, as well as two-circuit, double-break illuminated KB and CMC controls.

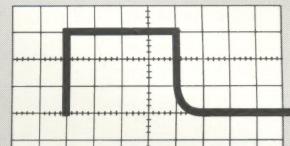
TOUCH-FEEDBACK PUSHBUTTON WITH CIRCUIT
1PB3001
1PB3002
1PB3003
1PB3004
1PB3005
1PB3006
1PB3007
1PB3008

SERIES 2 & 6 SWITCH MODULE* WITH CIRCUIT
2D625
2D652
2D653
2D630
2D627
2D647
2D648
2D649

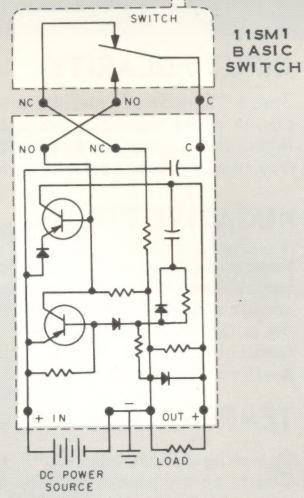
*See Catalog 67
for Actuator



SERIES 301ED OUTPUT CHARACTERISTICS

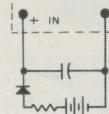


MILLISECOND PULSE WIDTH
ONE SHOT CIRCUIT DIAGRAM



MATCH SWITCH AND TERMINAL DESIGNATIONS: Observe input polarity with power source.

Where voltage drops exceed -10%, add LINE FILTER as shown.



Precision SPDT Switches

DIRECT ACTING LEAF TYPE PUSHBUTTON (Black Button)	TOUCH-FEEDBACK PUSHBUTTON (Black Button)
1PB15-T	1PB13 (Black Button) 1PB14 (Red Button) 1PB68 (Green Button)

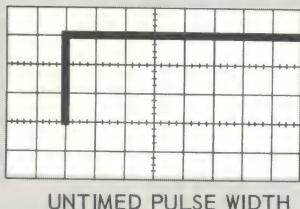


SERIES 2ED UNTIMED PULSE CONTACT BUFFER

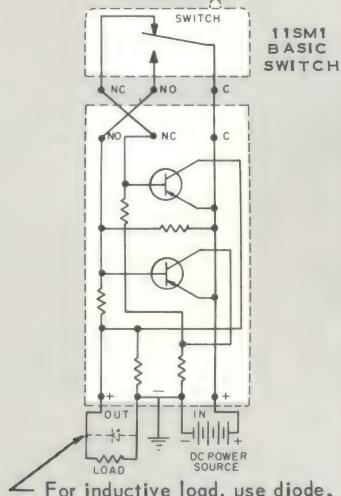
GENERAL

Series 2ED Untimed Pulse Contact Buffers produce a single square wave pulse as long as the controlling contacts are held actuated. These circuits handle loads up to 250 mA in two versions - - 100 to 500 ohms resistive and 500 ohms minimum resistive. Depending on the device selected, the input voltage can be +5 to +25 volts DC for positive voltage to the load or -5 to -25 volts DC for negative pulse to the load.

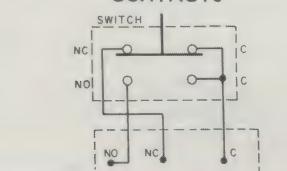
2ED OUTPUT CHARACTERISTICS



CONTACT BUFFER CIRCUIT



For inductive load, use diode.
ADAPTATION FOR USE WITH
TWO-CIRCUIT, DOUBLE-BREAK
CONTACTS



These circuits eliminate the effects of contact bounce that occurs with mechanical contacts during turn-on time. They produce a single pulse per actuation of the controlling switch. These circuits reduce radio frequency interference of mechanical contacts, and the effects of contact openings due to shock and vibration. They eliminate the problems of unstable contact resistance, and produce the untimed pulse irrespective of the speed with which the controlling contacts are actuated. The period of time the contacts are held actuated determines the pulse length.

DEVICE CHARACTERISTICS

These circuits contain solid state components. As such, the input terminals are polarized so that the DC Power Source terminals must be of the same polarity as marked on the circuit. Operation of the circuit in excess of 250 mA, or a short circuit across the output terminals may damage the circuit.

INDUCTIVE LOADS

When handling inductive loads with the Contact Buffer, such as relays, solenoids, etc., a diode should be placed across the output leads as shown below the circuit diagram.

TEMPERATURE RANGE

Operation: +32° F to +131° F

Rise time and fall time is reduced as temperature is lowered.

Storage: -65° F to +185° F

Soldering lead wires to circuit terminals should not exceed 600° F for longer than 10 seconds.

SWITCH/CIRCUIT ASSEMBLIES

These Contact Buffer circuits are offered connected to Touch-Feedback Pushbutton Switches and Series 2 Switch modules that panel mount and save on installation time. In addition, the circuit may be operated remotely from a wide variety of MICRO SWITCH Switches; i.e., many SPDT basic and limit switches, as well as two-circuit, double-break KB and CMC controls. Separate unlighted pushbutton switches are shown in center.

SPECIFICATIONS

Typical Rise Time: 0.75 microseconds
Typical Fall Time: 0.75 microseconds

Standby Current in Milliamperes is as follows:

2ED1 - 0.4 Supply Voltage
2ED2 - 0.95 Supply Voltage
2ED3 - 0.4 Supply Voltage
2ED4 - 0.95 Supply Voltage

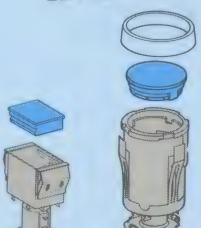
Output voltage is approximately 96% of input voltage due to transistor junction drops.

Without Pulse Circuits

LIGHT FORCE
PUSHBUTTON
(Black Button)
1PB81-T2



SERIES 2 & 6
SWITCH MODULE
(Without Actuator)
2D100*



*See Catalog 67
for Actuator

CONTACT BUFFER CIRCUIT

2ED1
2ED2
2ED3
2ED4

TOUCH-FEEDBACK PUSHBUTTON WITH CIRCUIT

1PB2001
1PB2002
1PB2003
1PB2004

SERIES 2 & 6 SWITCH MODULE* WITH CIRCUIT

2D617
2D618
2D619
2D620

*See Catalog 67
for Actuator

INPUT and OUTPUT VOLTAGE RANGE

+5 to +25 vdc
+5 to +25 vdc
-5 to -25 vdc
-5 to -25 vdc

HANDLES RESISTIVE LOAD OF

Over 500 ohms
100 to 500 ohms
Over 500 ohms
100 to 500 ohms

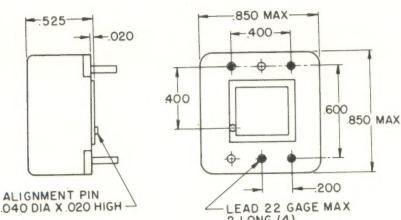


MOUNTING DIMENSIONS Separate Switches and Circuits

MICROSECOND PULSE "ONE-SHOT" For Printed Circuit Boards

Circuits 401ED1 to 401ED6

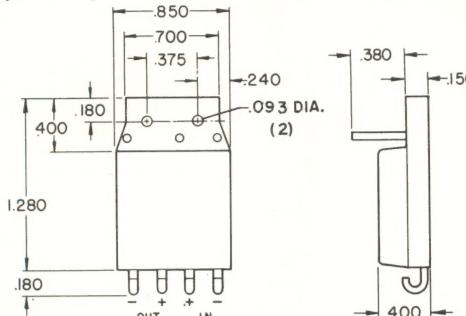
For use with controlling switches noted below:



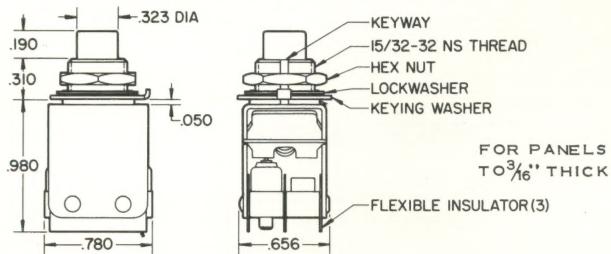
MICROSECOND PULSE "ONE-SHOT"

Series 100ED and 200ED Circuits

For use with controlling switches noted below,
except for operation of circuits 201ED2 and 211ED2.



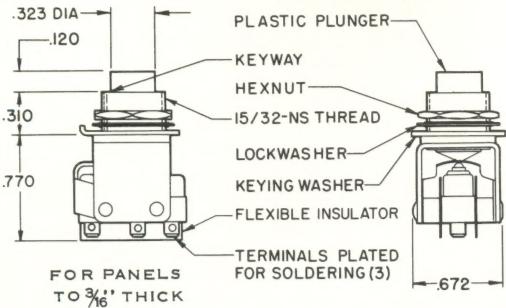
TOUCH-FEEDBACK PUSHBUTTON SWITCH



For Series 100ED, 200ED, and 401ED circuits above, use 1PB116,
1PB118, and 1PB399

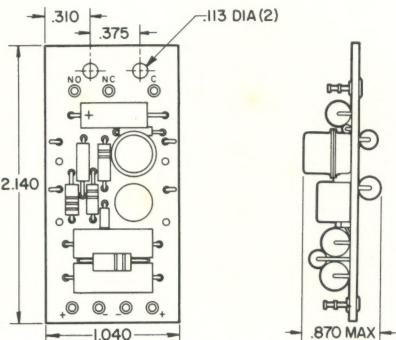
For Series 301ED and 2ED circuits below, use 1PB13, 1PB14, or
1PB68

COMPACT SIZE PUSHBUTTON SWITCH



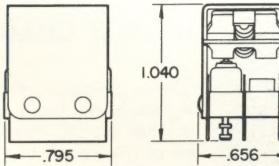
For Series 100ED, 200ED, and 401ED circuits above, use 1PB114
For Series 301ED, and 2ED circuits below, use 1PB15-T

MILLISECOND PULSE "ONE-SHOT"



Circuits 301ED1
to 301ED8

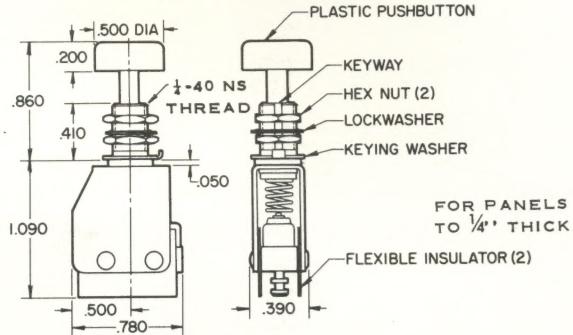
SERIES 2 SWITCH MODULE



Requires actuator
shown in Catalog 67

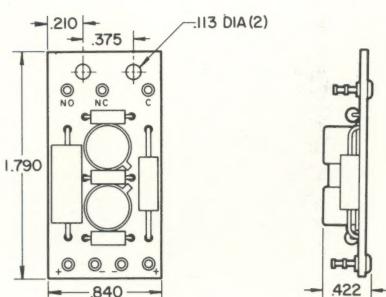
For Series 100ED, 200ED, and 401ED circuits above, use 2D121
For Series 301ED, and 2ED circuits below use 2D100

LIGHT FORCE PUSHBUTTON SWITCH



For Series 100ED, 200ED, and 401ED circuits above, use 1PB115
For Series 301ED, and 2ED circuits below, use 1PB81-T2

UNTIMED PULSE CONTACT BUFFER

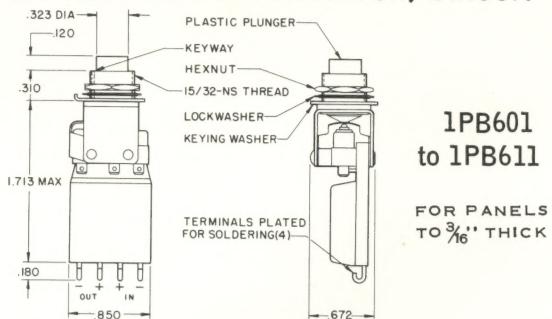


Circuits 2ED1
to ED4

MOUNTING DIMENSIONS - Switch/Circuit Assemblies

Series 100ED and 200ED MICROSECOND PULSE ONE-SHOT

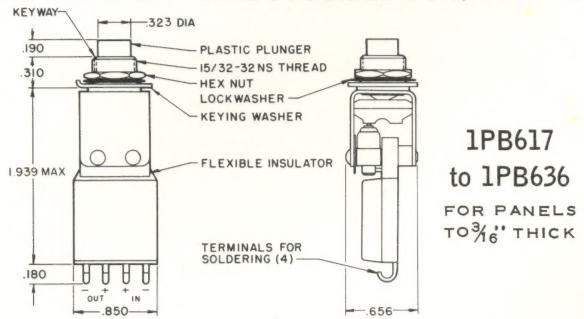
COMPACT SIZE PUSHBUTTON SWITCH/CIRCUIT



**1PB601
to 1PB611**

FOR PANELS
TO $\frac{3}{16}$ " THICK

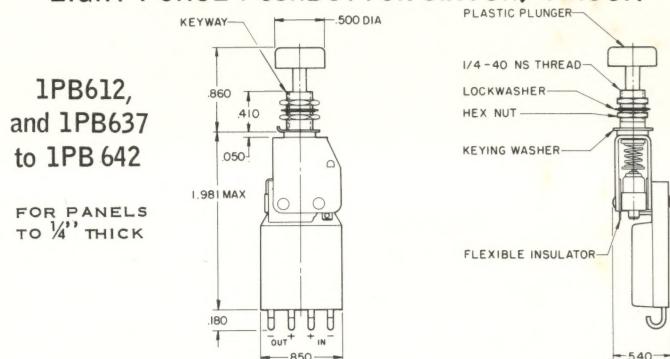
TOUCH-FEEDBACK PUSHBUTTON SWITCH/CIRCUIT



**1PB617
to 1PB636**

FOR PANELS
TO $\frac{3}{16}$ " THICK

LIGHT FORCE PUSHBUTTON SWITCH/CIRCUIT

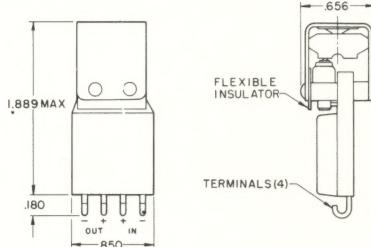


**1PB612,
and 1PB637
to 1PB 642**

FOR PANELS
TO $\frac{1}{4}$ " THICK

SWITCH MODULE WITH CIRCUIT Requires actuator shown in Catalog 67

**2D603
to 2D608**

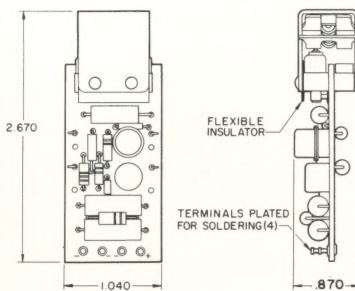


SWITCH MODULE WITH CIRCUIT

Requires actuator shown in Catalog 67

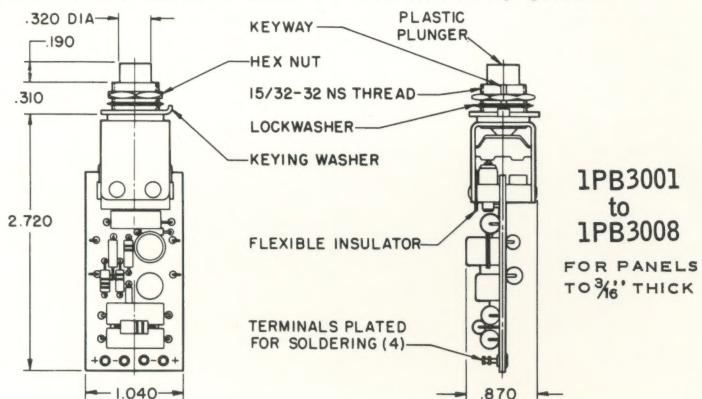
**1PB3001
to
1PB3008**

FOR PANELS
TO $\frac{3}{16}$ " THICK



Series 301ED MILLISECOND PULSE ONE-SHOT

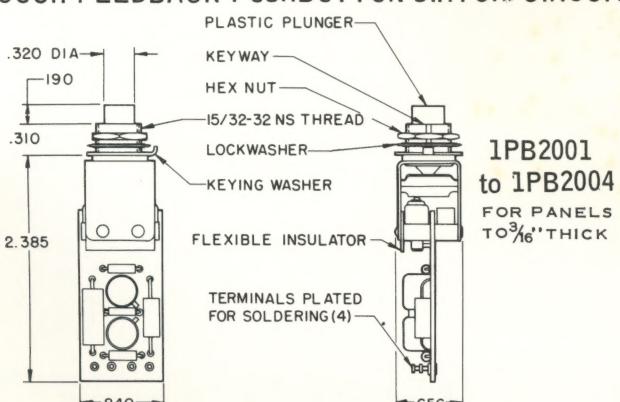
TOUCH-FEEDBACK PUSHBUTTON SWITCH/CIRCUIT



**1PB3001
to
1PB3008**

FOR PANELS
TO $\frac{3}{16}$ " THICK

Series 2ED UNTIMED PULSE CONTACT BUFFER TOUCH-FEEDBACK PUSHBUTTON SWITCH/CIRCUIT



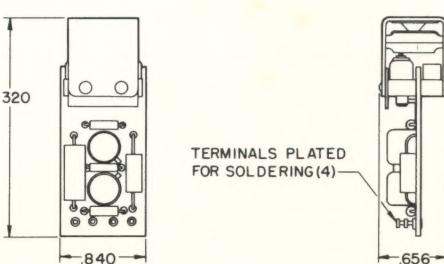
**1PB2001
to 1PB2004**

FOR PANELS
TO $\frac{3}{16}$ " THICK

SWITCH MODULE WITH CIRCUIT

Requires actuator shown in Catalog 67

**2D617
to 2D620**



SPECIAL CIRCUITS AND SWITCH ASSEMBLIES

MICRO SWITCH maintains branch offices Coast-to-Coast and Worldwide. These offices are staffed with experienced switching and circuit specialists who have solved thousands of critical switching problems. Let your switching problem be analyzed by these experts. They will offer practical suggestions for the solution. No obligation, of course. Branch Offices are located in the cities listed below.

ENGINEERING SERVICE

While the circuits and switches shown in this data fulfill most pulsing requirements, this is not the extent of this group of circuits. MICRO SWITCH has available, or will design and build when necessary, special circuits and switch assemblies to fit requirements not met by these standard devices. MICRO SWITCH also manufactures Industrial Long-Pulse circuits --- enclosed and basic pulse switches where contact bounce is not critical to the application. In addition, solid state relays are offered

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MICRO SWITCH LIST PRICE and DISCOUNT SCHEDULE D-ED.3

Covering MICRO SWITCH Products in Bulletin "ED"

Effective August 1, 1966

TERMS AND CONDITIONS OF SALE

- (a) DATA - All the data published in this schedule is effective as of the above date and is subject to change without notice.
- (b) ERRORS - All stenographic and clerical errors are subject to correction.
- (c) DISCOUNTS & PRODUCT CLASSES - Discounts are based on quantity ordered and shipped against one purchase order. All MICRO SWITCH products of the same product class and on one purchase order may be combined for quantity discount. Switches of different product classes may not be combined for quantity discount. Unclassified products may not be combined for quantity discount.
- (d) SHIPMENTS - All prices are F.O.B. Freeport, Ill.

(e) TAXES - The amount of any and all taxes shall be added to the price and be paid by the purchaser because of transaction under effective statute, or in lieu thereof, the purchaser shall furnish the seller with tax exempt certificates acceptable to the taxing authorities.

(f) TERMS OF PAYMENT - Net thirty (30) days.

(g) WARRANTY - Seller warrants its products to be free from defects in material and workmanship under normal use and service and seller will repair or replace without charge any such product it finds to be so defective on its return to seller within one year of date of shipment to the original purchaser. The foregoing is in lieu of all other expressed or implied warranties (except of title), guarantees, obligations, or liabilities on seller's part.

LIST PRICE AND DISCOUNT SCHEDULE

	BASIC CIRCUIT	LIST PRICE CIRCUIT ONLY	TOUCH-FEEDBACK PUSHBUTTON WITH BASIC CIRCUIT SOLDERED ON, AS SHOWN AT LEFT	SWITCH/CIRCUIT LIST PRICE	SERIES 2 SWITCH MODULE WITH CIRCUIT, WITHOUT ACTUATOR	LIST PRICE
"ONE SHOT" MICROSECOND PULSE	111ED2	\$12.90	1PB617, 1PB624, or 1PB631	\$16.70	2D603	\$15.55
	211ED1	13.65	1PB622, 1PB628, or 1PB635	17.45	2D607	16.30
	211ED2	13.35	1PB623, 1PB629, or 1PB636	17.15	2D608	15.95
	212ED1	11.85	1PB618, 1PB625, or 1PB632	15.65	2D604	14.50
	212ED2	11.85	1PB619, 1PB626, or 1PB633	15.65	2D605	14.50
	212ED4	12.90	1PB621, 1PB627, or 1PB634	16.70	2D606	15.55
"ONE SHOT" MILLISECOND PULSE (FORMERLY DC PULSE)	301ED1	23.05	1PB3001	27.10	2D625	26.50
	301ED2	23.05	1PB3002	27.10	2D652	26.50
	301ED3	27.55	1PB3003	31.60	2D653	31.05
	301ED4	27.55	1PB3004	31.60	2D630	31.05
	301ED5	28.55	1PB3005	32.60	2D627	32.00
	301ED6	28.55	1PB3006	32.60	2D647	32.00
	301ED7	34.55	1PB3007	38.60	2D648	38.00
	301ED8	34.55	1PB3008	38.60	2D649	38.00
CONTACT BUFFER	2ED1	7.75	1PB2001	11.80	2D617	11.25
	2ED2	7.65	1PB2002	11.70	2D618	11.15
	2ED3	7.75	1PB2003	11.80	2D619	11.25
	2ED4	7.65	1PB2004	11.70	2D620	11.15
"ONE SHOT" MICROSECOND PULSE	BASIC CIRCUIT	LIST PRICE CIRCUIT ONLY	COMPACT SIZE PUSHBUTTON WITH CIRCUIT AT LEFT ATTACHED	SWITCH/CIRCUIT LIST PRICE	LIGHT FORCE PUSH-BUTTON WITH CIRCUIT AT LEFT ATTACHED	LIST PRICE
	101ED2	12.90	1PB601	16.70	1PB612	16.95
	201ED1	13.65	1PB609	17.45	1PB641	17.70
	201ED2	13.35	1PB611	17.15	1PB642	17.40
	202ED1	11.85	1PB604	15.65	1PB637	15.90
	202ED2	11.85	1PB605	15.65	1PB638	15.90
'ONE SHOT' MICROSECOND PULSE	202ED4	12.90	1PB608	16.70	1PB639	16.95
	CIRCUIT	LIST PRICE CIRCUIT ONLY	SWITCH LISTINGS- USE WITH 401ED CIRCUITS. CAN ALSO BE USED WITH 100 AND 200ED CIRCUITS, EXCEPT 201ED2 AND 211ED2	LIST PRICE	SWITCH LISTINGS FOR 301ED CIRCUITS AND 2ED CIRCUITS	LIST PRICE
	401ED1	12.90	1PB118 - Snap Acting, Black Pushbutton	7.50	1PB13 - Snap Acting, Black PB	5.10
	401ED2	13.65	1PB399 - Snap Acting, Red Pushbutton	7.55	1PB14 - Snap Acting, Red PB	5.15
	401ED4	11.85	1PB116 - Snap Acting, Green Pushbutton	7.55	1PB68 - Snap Acting, Green PB	5.15
	401ED5	11.85	1PB115 - Low Force, Black Pushbutton	8.25	1PB81-T2 - Low Force, Black	6.00
	401ED6	12.90	1PB117 - Compact, Black Pushbutton	6.20	1PB15-T - Compact Black PB	4.10
	These circuits are for use with printed circuit boards. The actuating switch is sold separately.		2D121 - Series 2 Switch Module 12SM4 - Basic Switch 13SM3 - Basic Switch for Circuits 201ED2 and 211ED2 only	5.30 3.65 4.00	2D100 - Series 2 Switch Module 11SM1 - Basic Switch	2.70 1.20

PRODUCT CLASS

Product Class & Dis. Schedule	Product Class	Dis.
Basic circuits only (Requires separate switch) Series 2ED, 100ED, 200ED, 301ED & 401ED	91	R
Pushbuttons with circuit attached Series 1PB600, 1PB2000 & 1PB3000	92	R
Series 2 Switch Module with Pulse Circuit Attached (Does not include actuator) Series 2D600	97	W
Series 2 Switch Module Only (Does not include Pulse circuit or Switch Actuator) 2D100 & 2D121	87	W
Precision Switch Only (Does not include Pulse Circuit) Series 1PB10, 1PB100, & 1PB68, 1PB81 & 1PB399	43	H
Basic Switches 11SM1, 12SM4, 13SM3	27	H

DISCOUNTS

Dis.	1-9	10-19	20-49	50-99	100-199	200-499	500-999	1000 or larger*
H	None	10%	20%	30%	35%	37%	40%	*
Dis.	1-24	25-99	100-499	500-999	1000 or larger**			
R	None	10%	18%	26%	*			
W	None	10%	18%	26%	*			

*Contact MICRO SWITCH Branch Office or Authorized Distributor for information on larger quantities.

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